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Transverse single-spin asymmetry of weak boson, Drell-Yan and prompt photon production in p+p collisions at STAR

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Accessing the Sivers TMD function in proton+proton collisions through the measurement of transverse single spin asymmetries (TSSAs) in Drell-Yan and weak boson production is an effective path to test the fundamental

QCD prediction of the non-universality of the Sivers function. Furthermore, it provides data to study the spin-flavor structure of valence and sea quarks inside the proton and to test the TMD evolution of parton distributions.

The TSSA amplitude, A_N , has been measured at STAR in proton+proton collisions at $\sqrt{s} = 500$ -GeV, with a recorded integrated luminosity of 25 pb^{-1} .

Within relatively large statistical uncertainties, the current data favor theoretical models that include a change of sign for the Sivers function relative to observations in SIDIS measurements, if TMD evolution effects on the A_N are small.

RHIC plans to run collisions of transversely polarized proton+proton beams at $\sqrt{s} = 510$ -GeV in 2017, delivering an integrated luminosity of 400 pb^{-1} . This will allow STAR to perform a precise measurement of TSSAs in both Drell-Yan and weak boson production. The present status and future plans for the Sivers function program at STAR will be discussed as well as other observables sensitive to the non-universality of the Sivers function via the Twist-3 formalism, e.g. the TSSA of prompt photons.

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